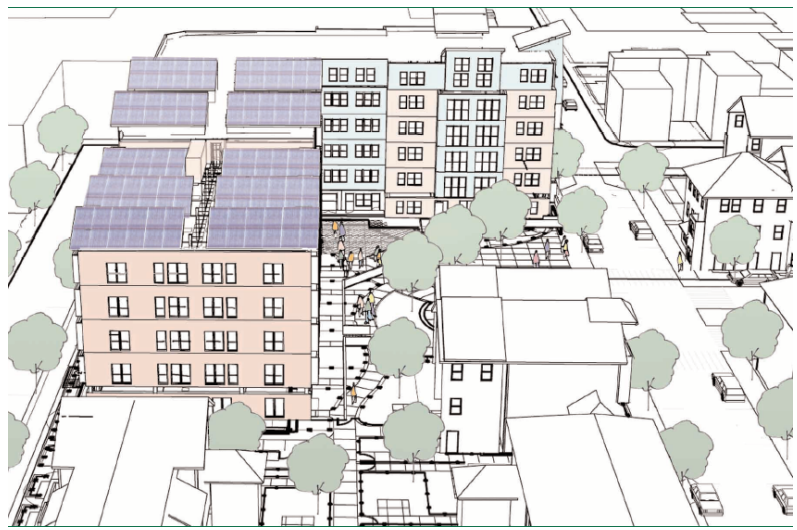
10th CANADIAN CONFERENCE ON BUILDING SCIENCE & TECHNOLOGY

Dynamic Interactions and Competing Objectives in: *Multifamily Green Building Design*

John Snell
Peregrine Energy Group

Ken Neuhauser
Conservation Services Group

May 12, 2005



PEREGRINE ENERGY GROUP

Integrated Design Topics

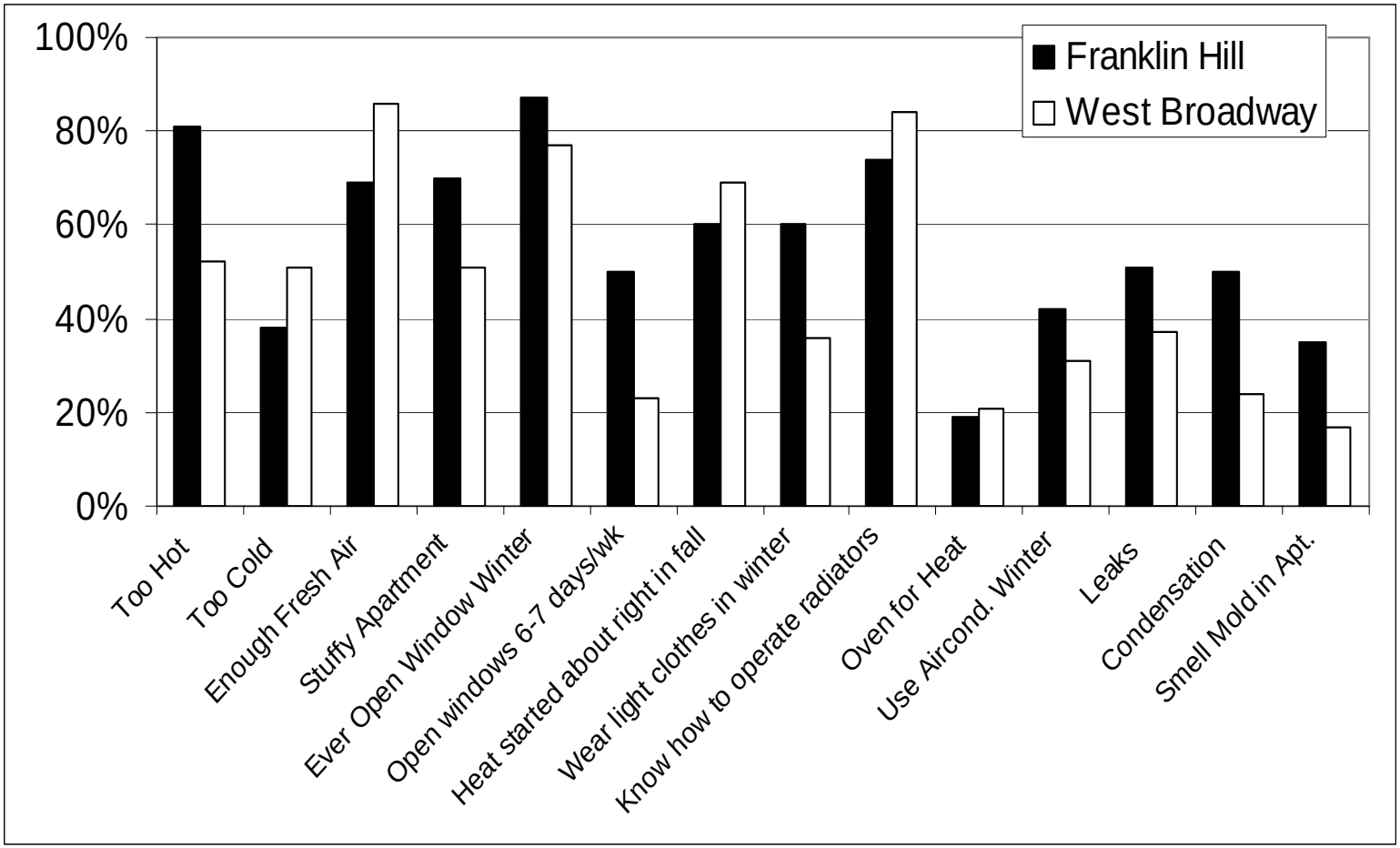
- Design Charrette
- Design Development
- “State of the Shelf” Technologies
- Construction Management
- Lessons Learned

But first, a little background. . .

The Project

http://www.themavericksite.org/index.htm

Resident Health Concerns



The Vision

Integrated Design Charrette

Sandra Henriquez, BHA Administrator
Kate Bennett, BHA Director Planning Department
Kathy Carton, BHA Planning Department
Dan Helmes, BHA Energy Director
Hank Keating, BHA Development Department
Zaida Roshandel, BHA Development Department
Ellie Saracini, Maverick Tenant's Organization
Ruth Capone, Maverick Tenant's Organization
Margaret Reid, Boston Public Health Commission
Alan Spera, HUD
Martin Nee, HUD
James Keefe, Trinity Development
Frank Edwards, Trinity Development
Sarah Bokland, Trinity Development
Lawrence Sparrow, Trinity Development
Michael Frazier, Maloney Properties
Al Caldarelli, East Boston CDC
Nancy Ludwig, ICON Architecture
Richard O'Dwyer, ICON Architecture
Janis Mamayek, ICON Architecture
Michelle Apigian, ICON Architecture
Fay Raynor, ICON Architecture
Faye Brown, Key Span Energy Company
David MacLellan, NStar Electric Company
Susan Wisler, Q&W
Vinnie Di Iorio, VADINC
John Schmid, Judith Nitsch Engineering
Deanna Foster, CWC Builders
Matt Bagedonow, CWC Builders

Richard Tinsman, MTC
Quincy Vale, MTC
Sam Nutter, MTC
Jack Spengler, Harvard School of Public Health
Bill Reed, Natural Logic
Robert Erb, Solar Design Associates
Ken Neuhauser, CSG / Energy Star Homes
Mike Schofield, CSG / Energy Star Homes
Richard Andelman, CSG/ Energy Star Homes
Adelaide Egan, CSG/ Energy Star Homes
Terry Brennan, Camroden Associates
John Snell, Peregrine Energy Group
And more….

Goal: Build a healthy & energy efficient public housing development in Boston – LEED?

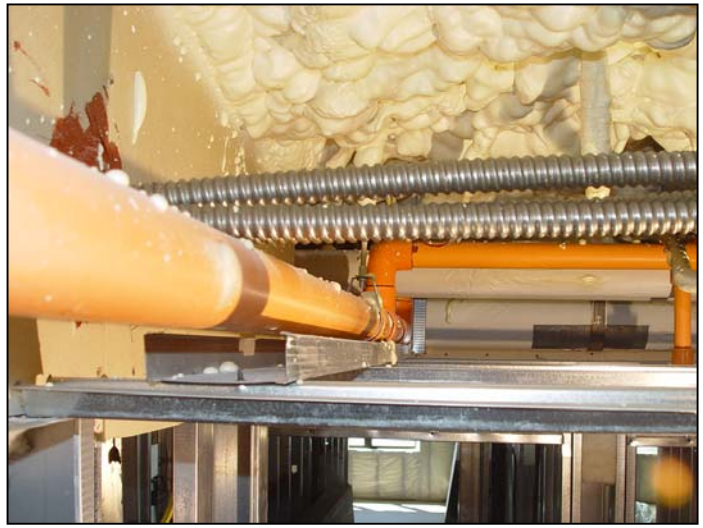
LEED Certification Challenges

- US HUD Construction Funding and Specifications predetermined
- Several Interpretations required and Innovation credit requested
- Is Multifamily commercial or residential?

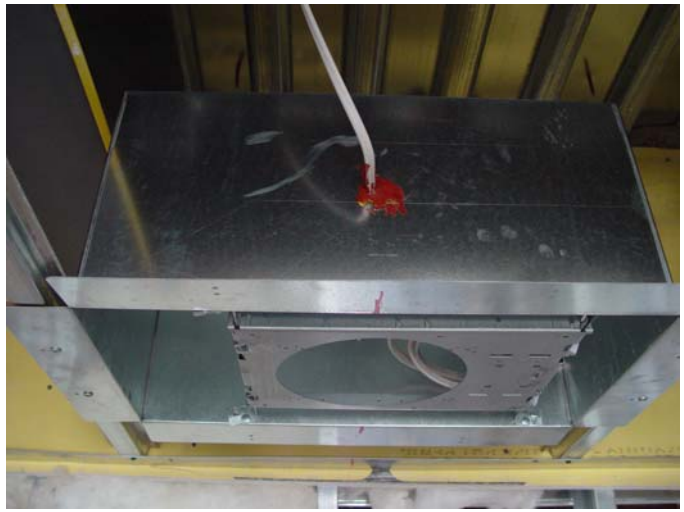
Integrated Design Development

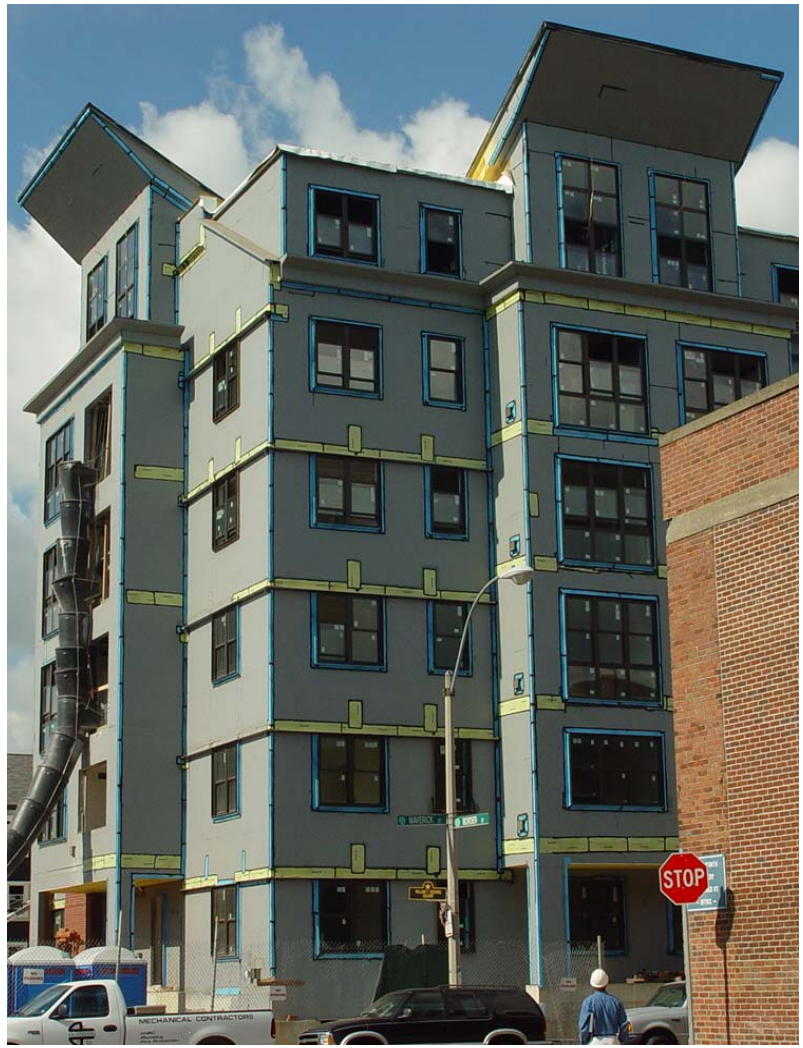
- Herding Cats
- Shuttle Diplomacy

Technologies - Insulation

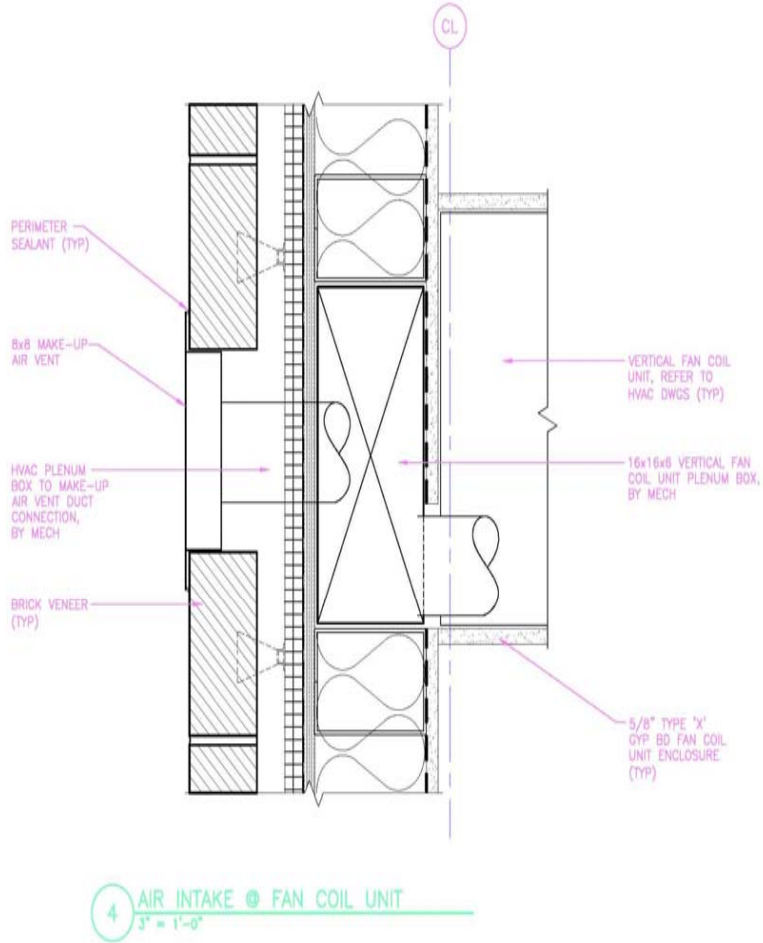


Technologies – Air Control





Technologies – Air Supply



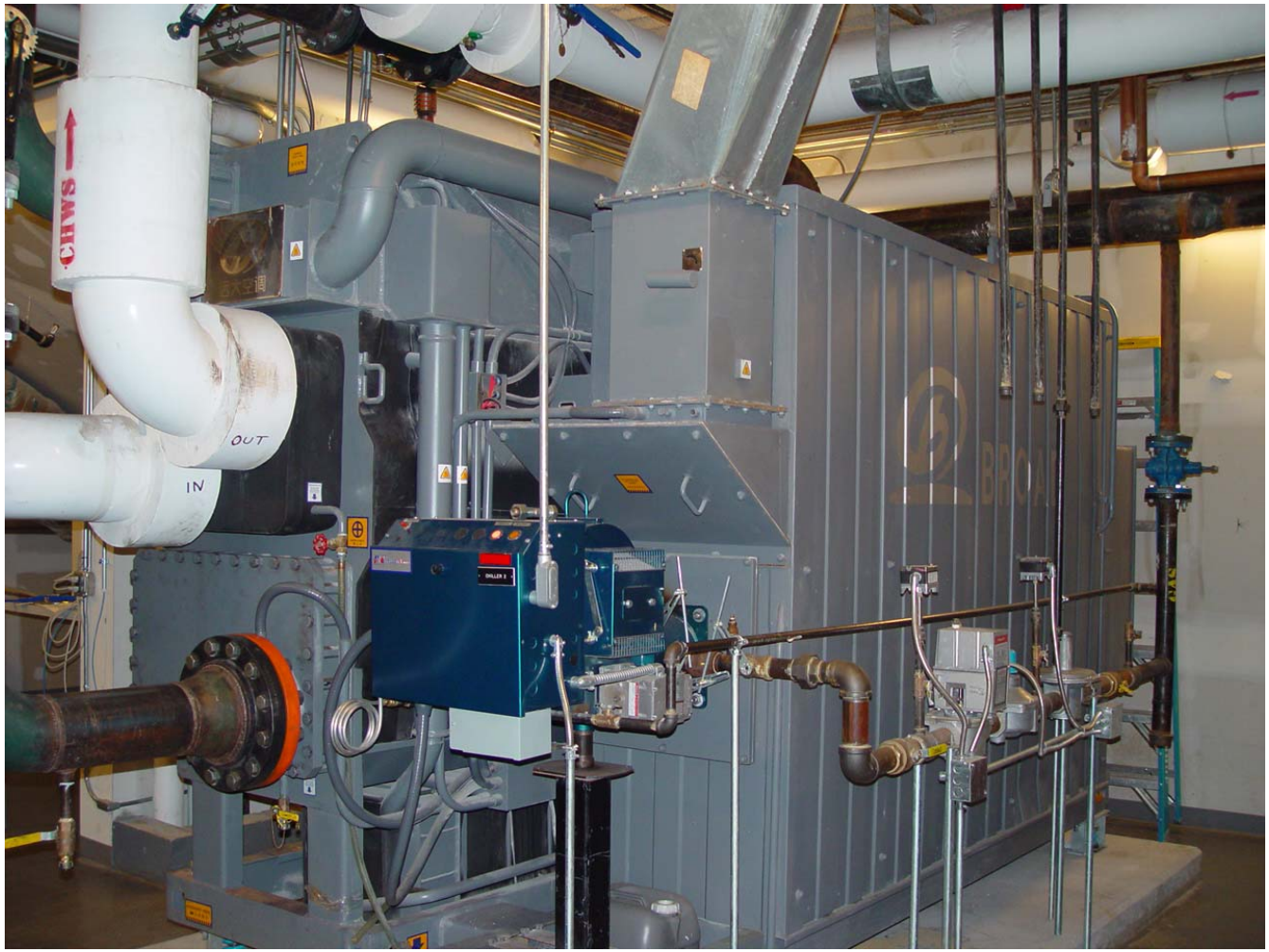
Technologies – Gas Cogen

Specifications:

Electrical Output (kW)	60	75
Thermal Output	440,000 Btu/hr	490,000 Btu/hr
Gas Input	760 scfh	900 scfh
Efficiency		
@ LHV of 905 BTU/scf	93.7%	91.6%
@ HHV of 1020 BTU/scf	83.1%	81.3%
Required Gas Pressure	4-14"wc	
Hot Water Flow	22 gpm	
Maximum Water Temperature	230°F	
Electrical Service	208V or 460V, 3PH, 3-wire	
Emissions Option	*Can meet air quality standards as stringent as Southern California's*	
Acoustic Level	70 dBa @ 20'	
Dimensions	6'10"L x 3'8"W x 3'10"H	
Weight	3,000 lbs	

Note:
Above performance data is valid up to 100°F ambient temperature.

Technologies – Gas Chiller



Technologies - PV

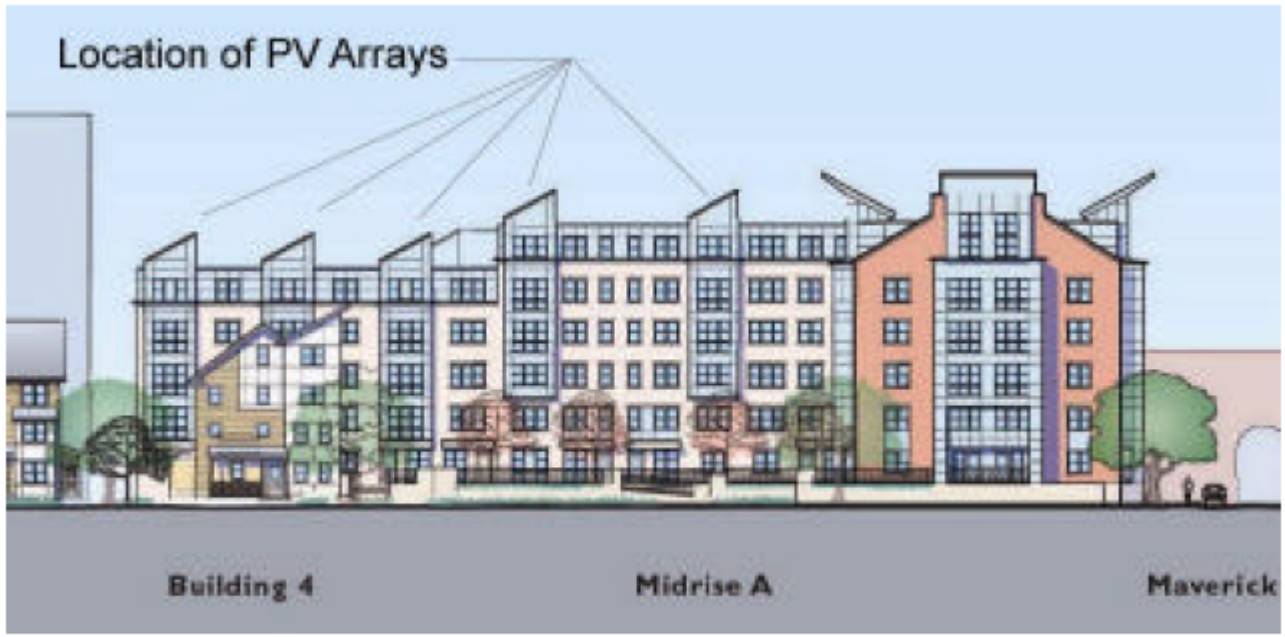


Figure 1: Proposed Solar Layout

Net Impact – Cash Flow

1 Buildings (mid-rise)

91 HUD Subsidized Apartments **119 Total Apartments**

		Estimated Incremental Dollar Cost	Annual Percent Consumption Savings Gas	Electric	Water	Net Annl Cost Savings	Payback	
I.	**Energy & Water Efficiency Measures**							
A)	Install high efficiency gas absorbtion chiller/ boiler 1 lump sum @ $84400	$84,400	-62.0%	12.0%		$2,208	5.6	years
	Eliminate DHW Load (chiller contribution)		20.3%			$10,278		
	Higher heating system efficiency		5.3%			$2,667		
B)	Install 75 kW Cogen 1 75 kW Cogen w/ 5 yr maintenance @ $192500	$192,500	-81.5%	18.8%		$11,274	7.7	years
	Eliminate DHW Load (Cogen contribution)		27.2%			$13,790		
C)	Install Solar PV 1 40 kW PV @ $336863	$336,863		2.9%		$8,142	41.4	years
D)	Install high performance windows 11900 Sq Feet of High Performance Windows @ $3	$35,700	0.5%	0.5%		$1,651	21.6	years
E)	Install EnergyStar Apartment Lights & Appliances 119 apartments @ $450	$53,550		4.0%		$11,125	4.8	years
F)	Airsealing/ controlled ventilation upgrades 119 Apartments @ $300	$35,700	1.0%			$507	70.4	years
	Energy Subtotal	$738,713	-89.3%	38.3%	0.0%	$61,641	12.0	years

Net Impact – Temperature

Monthly load hours and minimum, maximum zone temperatures for typical zone

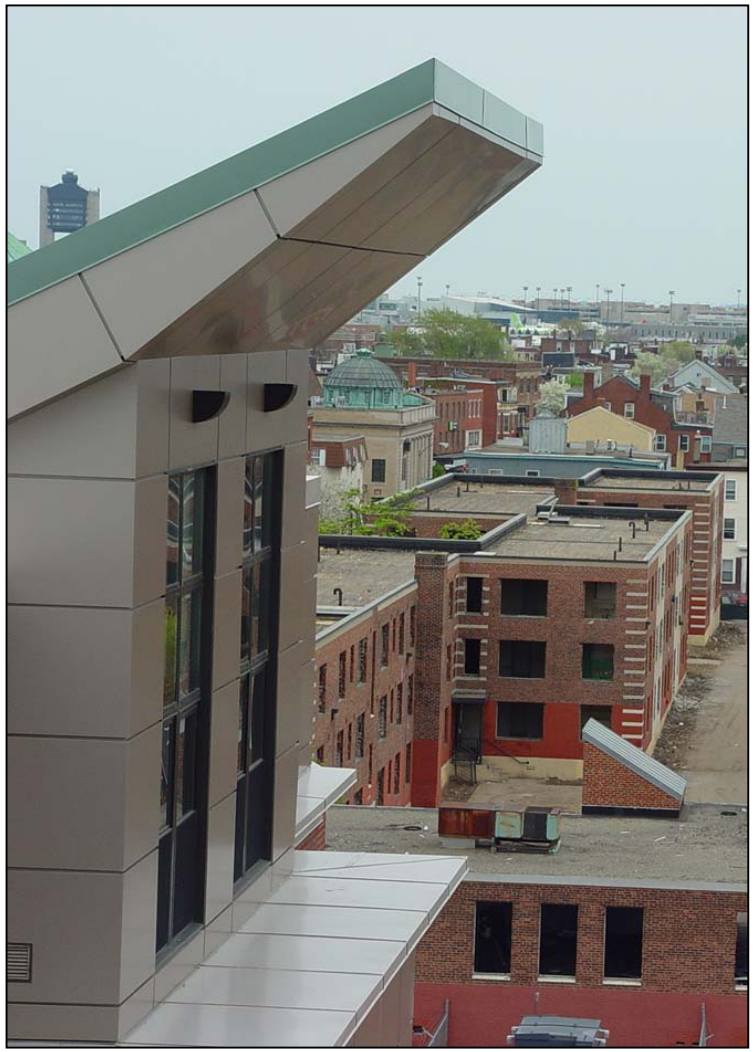
	Heating and Cooling Available All Year				Heating Available Sept 15 to June 15 Cooling Available June 16 to Sept 14	
Month	Cooling Load Hours	Heating Load Hours	Maximum Zone Temp. (F)	Minimum Zone Temp. (F)	Maximum Zone Temp. (F)	Minimum Zone Temp. (F)
Jan	61	367	74.1	70.1	79.0	70.1
Feb	98	248	74.0	70.1	78.6	70.1
Mar	235	208	74.2	70.1	86.9	70.1
Apr	407	45	75.3	70.2	92.9	70.1
May	631	4	76.0	70.2	94.3	70.1
Jun	706	-	76.8	72.9	97.2	70.1
Jul	744	-	77.3	73.8	77.2	73.8
Aug	743	-	76.3	73.7	76.2	73.7
Sep	667	2	76.2	72.2	89.0	70.1
Oct	496	31	74.6	70.2	85.4	70.2
Nov	257	138	74.1	70.2	81.5	70.1
Dec	147	254	74.1	70.1	83.6	70.1

Construction Management

Results – As Built

Lessons Learned

- Integrated Design Process Challenging for Multifamily
- High internal gains a concern
- Need better air management options



Contact

John Snell

Peregrine Energy Group

617-367-0777 x230

jsnell@peregrinegroup.com

Ken Neuhauser

Conservation Services Group, Inc.

508-836-9500 x3226

ken.neuhauser@csgrp.com

Credits

Architectural Drawings and MTC final report: ICON Architecture

Photographs: Peregrine Energy Group